

IMAGE FORMING APPARATUS

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority under 35 USC 119 of Japanese Patent Application No. 2000-158323 filed in JPO on May 29, 2000, the entire disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention generally relates to an image forming apparatus such as facsimile machine having a power save mode to suppress power consumption.

Description of the Related Art

[0003] Recent image forming apparatus such as facsimile machines, photocopiers, printers widely utilized in offices have a power save mode that brings the apparatus into a power save condition to suppress power consumption if the apparatus is not operated for a predetermined period.

[0004] Such image forming apparatus has two blocks of processing circuits, which are grouped by their functions and roles. One block consists of processing circuits that are operated only when necessary, and the other block consists of

processing circuits that are always operated. The former block of processing circuits is brought into the power save mode if a non-use condition continues over a predetermined period.

SUMMARY OF THE INVENTION

[0005] The present invention is directed to an image forming apparatus that takes voltage from an external commercial power source, uses a power transformer to cause the power source voltage to drop and use it for the apparatus, and an object of the present invention is to provide an image forming apparatus that has an improved power save mode and high reliability.

[0006] According to one aspect of the present invention, there is provided an image forming apparatus including a plurality of processing circuits categorized into first and second blocks with respect to respective functions of the circuits, a power transformer having a plurality of secondary windings, a first power supply unit for always feeding DC current to the first block of processing circuits from at least one of the secondary windings, a second power supply unit for feeding DC current to the second block of processing circuits from the seconding windings other than the above-mentioned at least one of the secondary windings, at least one switch for interrupting the DC current between the secondary windings and the second block of processing circuits, and a control unit for controlling the respective switch such that the DC current from the secondary windings to the second block of processing circuits is interrupted in a power save mode and the DC current is fed to the second block of processing circuits from the secondary windings in a normal mode.

[0007] The control unit may be operated with the DC current from the first power supply. The image forming apparatus may further include a voltage

converting circuit for converting DC voltage of the first power supply unit to DC voltage of another level such that the DC voltage of another level is fed to the second block of processing circuits. The second block of processing circuits may include an image processing circuit, a printing unit, an image scanning unit and a communication control unit, and the DC current may be fed to the second block of processing circuits from the voltage converting circuit in the power save mode. The voltage converting circuit may be a DC to DC converter or a three-terminal regulator.

[0008] Additional objects, aspects, benefits and advantages of the present invention will become apparent to those skilled in the art to which the present invention pertains from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0009] Figure 1 is a block diagram showing major elements of an image forming apparatus according to the present invention;

[0010] Figure 2 is a block diagram showing part of a signal processor and a communication unit used in the image forming apparatus shown in Figure 1;

[0011] Figure 3 illustrates a first modification made to the embodiment shown in Figure 1; and

[0012] Figure 4 illustrates another modification.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Embodiments of the present invention will now be described in reference to the accompanying drawings.

[0014] Referring to Figure 1, illustrated are a continuous power block and a power save block of an image forming apparatus of the present invention. The image forming apparatus may be a facsimile machine.

[0015] The illustrated image forming apparatus takes a commercial power source "e", which is an AC current provided from a remote place, causes it to drop through a power transformer T, and feeds it in the form of DC current to respective processing circuits of the apparatus through a power source block A for continuous power supply and another power source block B for power saving. The AC commercial power source "e" is supplied from a primary winding T1 of the power transformer T to a plurality of secondary windings T2A and T2B of the blocks A and B, and this AC power source is converted to DC current by a rectifier (not shown) before it is transmitted to the respective processing circuits.

[0016] The continuous power source block A has a line Lo extending therefrom. This line Lo becomes a signal processor power source line La to feed power to CPU and modems in a signal processor. The line Lo is also branched to an image processor line Lb and a communication unit line Lc. The line Lb is connected to DC/DC converters 6 and 6', and the line Lc is connected to a three-terminal regulator 7. In this manner, even if the apparatus is in the power save mode, sufficient power is fed to particular processing circuits, e.g., image processor and communication unit, such that these processing circuits can perform given jobs. It should be noted that more than one line may extend from the continuous power block A.

[0017] In the DC/DC converters 6 and 6', the DC power fed from the line Lo (+5V) is shifted to a level (e.g., +12V and -12V) required by operational amplifiers (OPs) used in a filter and amplifier of the communication unit. In the three-terminal regulator 7, the DC power of the line Lo is further lowered to a level (e.g., +3.3V) required by the image processor, image scanner and printer.

[0018] On the other hand, the power save block B has a plurality of separately-extending power source lines L1 to L5, each line being dedicated to a particular group of processing circuits having similar functions such that a particular value of voltage is fed to that group. A plurality of open-close switches SW are provided on these lines L1 to L5. It should be noted that more than five lines may extend from the power save block B.

[0019] In the illustrated example, the line L1 feeds 24V to a motor of a photosensitive drum and a laser driver, the line L2 feeds 5V to CPU and modem, the line L3 feeds 3.3V to the image processor, printer and image scanner, and the lines L4 and L5 feed 12V and -12V to the operational amplifiers in the filter and amplifier circuits of the communication unit.

[0020] An interlock switch 8 is provided for detecting whether an apparatus cover is opened (e.g., when a maintenance work is conducted), and interrupting the power supply to the motor, high voltage power supply and laser scanner for safety. When the interlock switch 8 is turned on, the 24V power to a printer motor is also stopped.

[0021] Referring to Figure 2, illustrated is a schematic diagram of the signal processor and communication unit, both of which are fed the power from the block A. The line Lo feeds DC 5V to CPU 1 of the signal processor and a modem 2 of the communication control circuit. The filter circuit 3 in the communication unit and the operational amplifier of the amplifying circuit 4 have 12V and -12V from the

DC/DC converters 6 and 6'.

[0022] The present invention is not limited to the illustrated embodiment, and Figures 3 and 4 illustrate modifications. The power transformer T' of Figure 3 has a single primary winding and a plurality of secondary windings. The power transformer T'' of Figure 4 has a plurality of primary windings and a plurality of secondary windings.

[0023] In each of these drawings, the commercial power source "e" is fed to the primary side, the block A does not have an open-close switch, the lines L1 to Ln extending from the block B have open-close switches SW respectively, and all the lines L1 to Lo of the blocks A and B have AC/DC converters 5 to convert AC power source induced at the secondary side of the power transformer T', T'' to DC power source. Since the switches SW are located upstream of the AC/DC converters 5 to interrupt the power supply, energy efficient is further improved.

[0024] A fundamental operation of the image forming apparatus will now be described.

[0025] When the apparatus is in a normal mode, the signal processor detects such a condition and closes the switches SW on all the lines L1 to Ln of the block B so that the power is supplied to the respective processing circuits. When the apparatus is switched to the power save mode, the signal processor opens all the switches SW to interrupt the power supply. In this mode, however, the other block A feeds the power to the signal processor, image processor, printer, image scanner and communication unit. Accordingly, when the signal processor detects an instruction command such as execution of facsimile data reception, the power is supplied to relevant circuits such that they can carry out necessary jobs.